

## CLAIMS

What is claimed is:

1. A plastid transformation vector for a stably transforming a plastid, comprising, as operably-linked components, a first flanking sequence, a DNA  
5 sequence coding for an insulin-like growth factor-1 (IGF-1) or, which is capable of expression in said plastid genome, and a second flanking sequence.
2. The vector of Claim 1, wherein the DNA sequence coding for the IGF-1 is a synthetic IGF-1 (IGF-1s) and consists of about 60% adenine and thymine nucleotides.
- 10 3. The vector of Claim 1 further comprising a regulatory sequence.
4. The vector of Claim 3, wherein said regulatory sequence comprises a promoter operative in said plastid genome.
5. The vector of Claim 4, wherein said promoter is 16 sRNA.
6. The vector of Claim 3, wherein said regulatory sequence comprises  
15 psbA 5' and psbA 3' elements.
7. The vector of Claim 3, wherein said regulatory sequences further comprise a 5' UTR capable of providing transcription and translation enhancement of said DNA sequence coding for IGF-1.
8. The vector of Claim 3, wherein said regulatory sequences further  
20 comprise a 3' untranslated region (UTR) capable of conferring transcript stability to said IGF-1.
9. The vector of Claim 1, wherein said first flanking sequence is trnI, and wherein said second flanking sequence is trnA.
10. The vector of Claim 1, wherein the vector is component for stably  
25 intergrating into a plastid genome of a plant, and wherein said first and second flanking DNA sequences are substantially homologous to sequences in a spacer region of said plastid genome, and wherein said first and second flanking sequences are conserved in the plastid genome of said higher plant species.
11. The vector of Claim 10, wherein said spacer region is a transcriptionally  
30 active spacer region.

12. The vector of Claim 10, wherein said *trnI* and *trnA* provide for homologous recombination to insert an IGF-1 or region of an inverted repeat region of a chloroplast genome.

13. The vector of Claim 1, wherein said DNA sequence coding for IGF-1 or  
5 a substantially homologous DNA sequence of IGF-1 is located in a single copy region of said plastid genome.

14. The vector of Claim 7, wherein said 5' UTR is a 5' UTR of *psbA*.

15. The vector of Claim 8, wherein said 3' UTR is a 3' UTR of *psbA*.

16. The vector of Claim 1, further comprising a DNA sequence encoding a  
10 selectable marker.

17. The vector of Claim 16, wherein said selectable marker is an antibiotic-free selectable marker.

18. The vector of Claim 17, wherein said antibiotic-free selectable marker is Betaine aldehyde dehydrogenase (BADH).

19. The vector of Claim 16, wherein said DNA sequence encoding is  
15 selectable marker encodes an antibiotic resistance selectable marker.

20. The vector of Claim 19, wherein said antibiotic resistance selectable marker is *aadA*.

21. A method for producing IGF-1 comprising:  
20 integrating the plastid transformation vector of Claim 1 into the plastid genome of a plant cell; and  
growing said plant cell to thereby express said IFN.

22. The method of Claim 21, wherein said IGF-1 is competent to produce an immunogenic response in a mammal.

23. The method of Claim 22, wherein said immunogenic response is  
25 substantially free of negative side effects associated with injected IGF-1.

24. An isolated and purified IGF-1, competent to produce and immunogenic response in a mammal.

25. The isolated and purified IGF-1 of Claim 24, wherein said IGF-1 is a  
30 synthetic IGF-1 having an adenine and thymine DNA content of about 60%.

26. An orally administerable therapeutic human interferon IGF-1, suitable for oral administration to a mammal.

27. A method for variable-expressing IGF-1 comprising:  
integrating a plastid transformation vector according to Claim 1 into a  
plastid genome of a plant cell; and  
growing said plant cell to express said IGF-1.
- 5 28. A plant stably transformed with the transformation vector of Claim 1.
29. A progeny of the plant of Claim 28.
30. A seed of the plant of Claim 28.
31. A part of the plant of Claim 28, comprising a plastid including said  
DNA sequence coding for therapeutic human interferon IFN.
- 10 32. The plant of Claim 28, wherein said plant is an edible plant suitable for  
mammal consumption.
33. The plant of Claim 28, wherein said plant further comprises at least one  
chloroplast transformed with the vector of Claim 1.
34. The plant of Claim 28, wherein said plant further comprises mature  
15 leaves transformed with the vector of Claim 1.
35. The plant of Claim 28, wherein said plant further comprises young  
leaves transformed with the vector of Claim 1.
36. The plant of Claim 28, wherein said plant further comprises old leaves  
transformed with the vector of Claim 1.
- 20 37. The plant of Claim 28, wherein the expression of IGF-1 is at least about  
6.0 percent total soluble protein.
38. The plant of Claim 28, wherein said expression of IGF-1 in said edible  
plant is between about 9.5-32.5% total soluble protein.